

# **Analyzing Malaria Incidences in the World Population**

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In the 20th century, malaria killed between 150 million and 300 million people, accounting for 2 to 5 percent of all deaths (Carter and Mendis, 2002). It's a disease that has been mentioned in historical documents since 2700 BC, and over the years has ravaged people, crops, and cattle. However, with modern scientific breakthroughs Malaria curability has increased exponentially and with this new found ability scientists are focused on prevention as a means of eradication. Experts predict that by 2050 Malaria could be eradicated with a heavy focus on Malaria intervention ( Newman, 2019). But what does this mean for us, and how does the data show this advancement to eradication? By utilising data from 2000-2019 we can see the micro trends in Malaria infections to understand how changes in our world health efforts have affected the fight against Malaria. In order to help gain an understanding of malaria incidences I will be analyzing the data and looking at the produced visualizations to draw upon trends shows, then confirming those trends using secondary sources.

In order to ensure that the data I would be analyzing was accurate I decided to use information from The World Bank Open Database. The data itself that I selected was a csv file entitled *Incidence of malaria (per 1,000 population at risk)*. This essentially means that the data looks at the incidence of malaria on a smaller scale of 1:1000. This helps us look at the data on a more manageable scale and ensures that our graphs aren't on a scale that skews the appearance of the data. The data looks at the origin of the malaria cases rather than the place that they are diagnosed. An example of this is the United States of America where there are annually approximately 2,000 cases of malaria diagnosed a year (CDC, 2022) but these cases are found in returning travellers. Within the dataset certain countries are missing information completely or have certain years of information missing and this could be due to the limitations of The World

Bank's data commission or due to individual countries' circumstances. For the sake of continuity I only included the countries which had data available for each range, this is because no data can easily skew the set and create outliers that ordinarily may not exist. In order to understand the data in an effective way I made the decision to utilise bar charts to understand each countries Malaria incidence by year between 2000-2019, as well as compiling the data to plot a line graph for the world incidence between 2000-2019. By using these graphs it allows me to visualize the data in a way that is easier to understand.

In order to graph the csv file I used *matplotlib* which is a python plotting library. When producing my graphs I produced two types in order to convey different information.

- 1) 20 Bar charts which look at each year between 2000-2019 and the incidence of malaria by country
- 2) 1 Line graph that looks at the world incidence of malaria between 2000-2019

#### [Link to all Graphs](#)

By having these two graph styles it allows me to see the data in different ways as well as providing me with the chance to compare the year over year (YOY) changes by country and overall. Looking at the bar charts the countries which have the most incidences of malaria are Burkina Faso which of the 20 sample years has the highest incidence 11 times, the Solomon Islands has the highest incidence 6 times, Rwanda has the highest incidence 2 times, and most recently Benin has had the highest incidence (Figure 1).

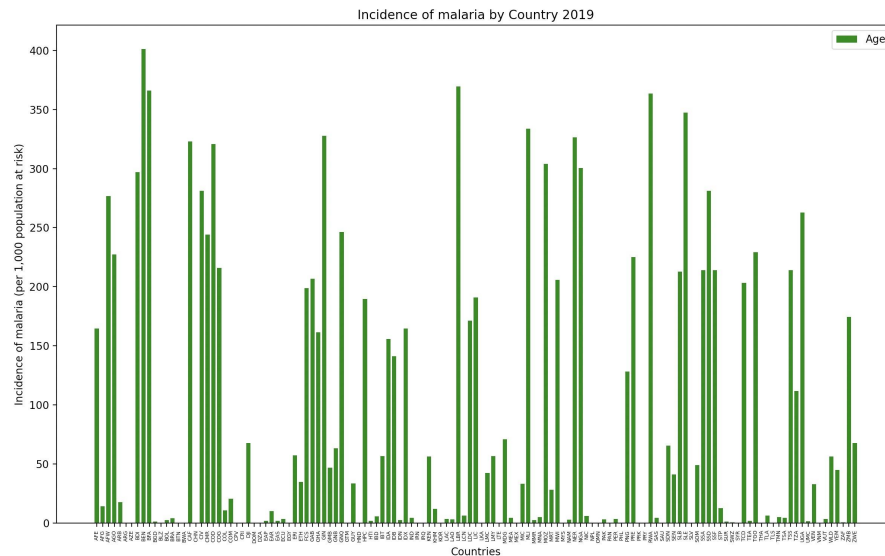


Figure 1: Incidence of Malaria 2019

These countries may seem relatively small in population, however, while looking at the incidences per 1,000 the rate is extremely high. These visualizations help us look at YOY changes and see which countries seem to be tackling the malaria crisis and which countries seem to be struggling. It's important to note that the barcharts don't tell the whole story as they look at cases on a country by country basis and year by year basis. If we want to use the data to see how the world is combating malaria and how on track we are to the 2050 malaria eradication goal then we need to look at the historical data for the world to see how trends have changed, using this historical data along with secondary sources we can conclude on what methods of malaria prevention and eradication work as well as which ones don't.

As mentioned, the historical data and trends along with secondary sources can help to conclude on what measures of prevention work and what measures don't. An example of this is malaria prevention bed nets, which are nets coated in a non toxic insecticide that is draped over

the bed. These nets help protect people while they're sleeping in hot damp areas from malaria carrying mosquitos. The nets were introduced in the early 2000's in Tanzania and were tested on 6706 kids (Vogel, 2022). The nets increased the rate of survival by 26%, when we look at the graph in figure 2 we can see that aside from the year 2001 there is a steady decline in the rate of malaria incidences.

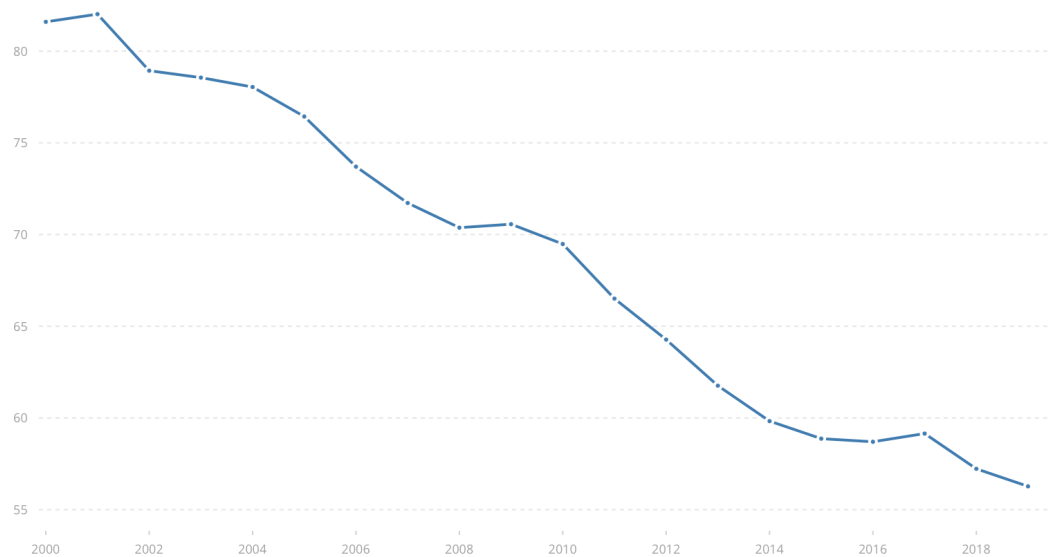


Figure 2: World Incidence of Malaria

The Global Fund to Fight AIDS, Tuberculosis and Malaria (The Global Fund) was established in 2002, and provided 122 million bed nets along with 142.4 million Malarone (Malaria Treatments). The global fund has provided these treatments and preventative measures in order to fight malaria in impoverished countries. Figure 3 highlights the impact that the global fund has had on the fight against malaria.

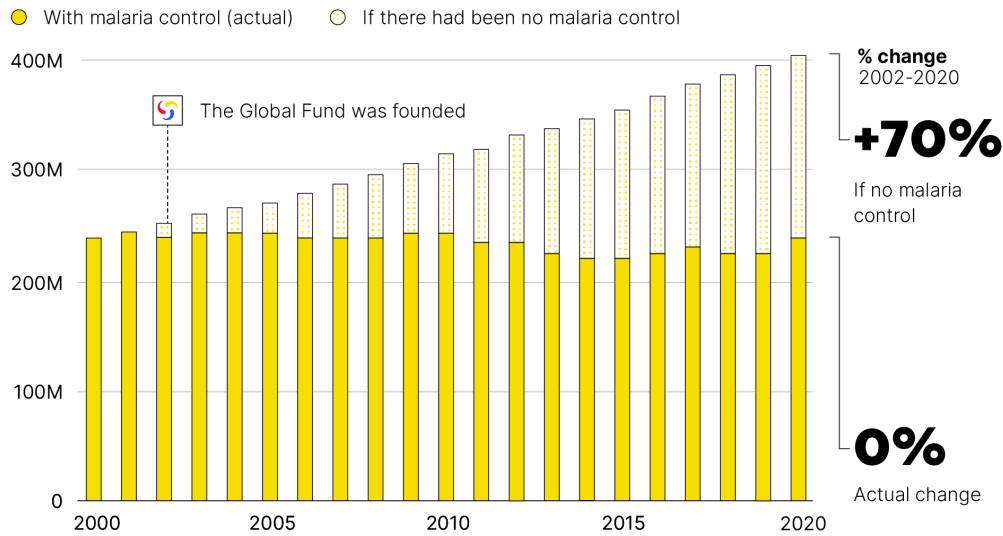


Figure 3: Global Fund Malaria Prevention

However, with all the data discussed today there's a problem, the accuracy of reporting is unknown. Given that malaria mostly impacts impoverished nations with underfunded healthcare the number of cases and deaths likely go under reported so we largely rely on the information provided to us and consider it accurate. We can see that the past two decades has resulted in a steady decrease of malaria incidence and this is undoubtedly due to the new technologies and campaigns which reach countries suffering from malaria and help to prevent cases, in order to further prevent malaria infections and eradicate it as a whole by 2050 we as a society need to continue to aggressively fight malaria, and while we can continue to fight malaria by using a combination of preventative techniques and remedies such as Malarone it isn't enough we need to be working to bolster the healthcare systems of these regions. The COVID-19 pandemic disrupted the fight against malaria in unimaginable ways, overwhelming healthcare systems, and crippling people's immune systems. From our early graphs (figure 1) we can see that smaller countries are the easiest victims to fall prey to a healthcare system being overwhelmed and

diseases taking over. In order to help fight malaria we need to look to the future and create solutions for not just fighting malaria but looking at fighting other diseases.

The fight against malaria has progressed tremendously over the last two decades however it's not over yet. Looking at our modeled data we can see that we're making progress and when scientific innovation is introduced it changes the course, but we can also see that when unexpected things like the COVID-19 pandemic occur it can entirely throw off the plan to tackle malaria. With this knowledge we need to be proactive in our efforts to combat malaria using our data and analytical capabilities. But as we've seen with diseases and viruses they can easily mutate. Would something like this potentially happen with malaria? For now we can't say but we need to be prepared for even the most unlikely, especially given the effort that it has taken to combat malaria, we need to make an effort to help protect everyone from diseases like malaria and that path to protection starts with data.

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